REMARKS

This Amendment is submitted in response to the Office Action mailed on March 30, 2005. Claims 1 - 15 are pending, and subject to restriction.

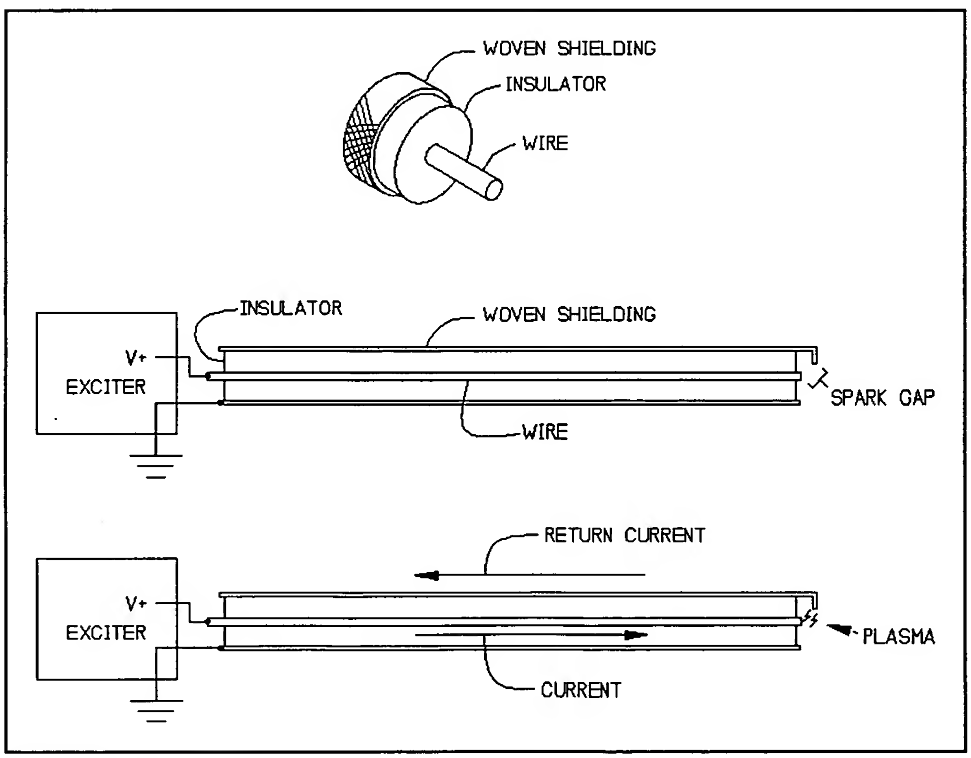
Applicants confirm the election of claims 1 - 10 and 15. Claims 11 - 14 are withdrawn from consideration. Claims 16 - 22 are added. No fee is due.

Applicants elect the species of Figure 19.

INTRODUCTORY REMARKS REGARDING THEORIES OF OPERATION OF INVENTION AND PRIOR ART

This discussion will first present some theories of operation of the prior art and the invention. These theories were explained to the undersigned attorney Greg Welte by Inventor Robert Ponziani, primarily in several telephone conversations held in late May and early June, 2005, in connection with Welte's consideration of the Office Action to which this Amendment responds.

The top of Sketch 1, below, illustrates a shielded cable. A woven conductive shield surrounds a conductive wire.

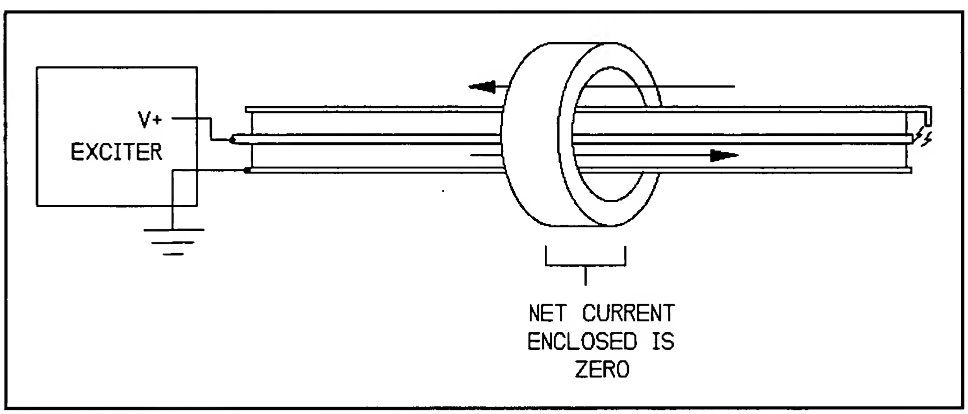


Sketch 1

The center of the Sketch is a cross-sectional view of such a cable, when used in an igniter system in a gas turbine engine.

The bottom of the Sketch illustrates currents which flow in the cable, according to conventional wisdom. It is emphasized that, according to the conventional wisdom, all current crossing the SPARK GAP returns to the EXCITER as RETURN CURRENT, through the shielding.

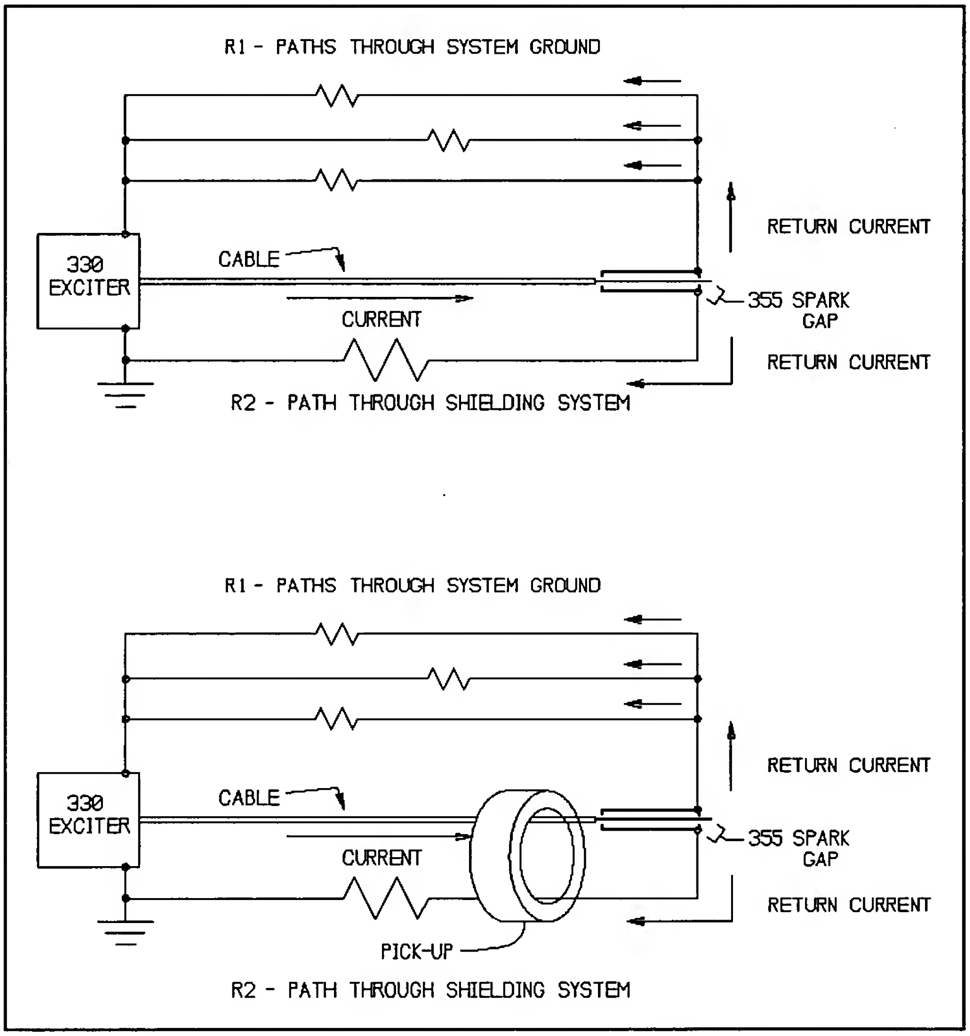
In this situation, Sketch 2, below, illustrates how an inductive probe will detect no current. The current travelling to the right cancels that travelling to the left. The net current is zero.



Sketch 2

The Inventor has theorized that, perhaps, in a gas turbine engine igniter, the net current may not be zero. That is, all

current may not return through the shielding. Sketch 3, below, illustrates one view of the idea.



Sketch 3

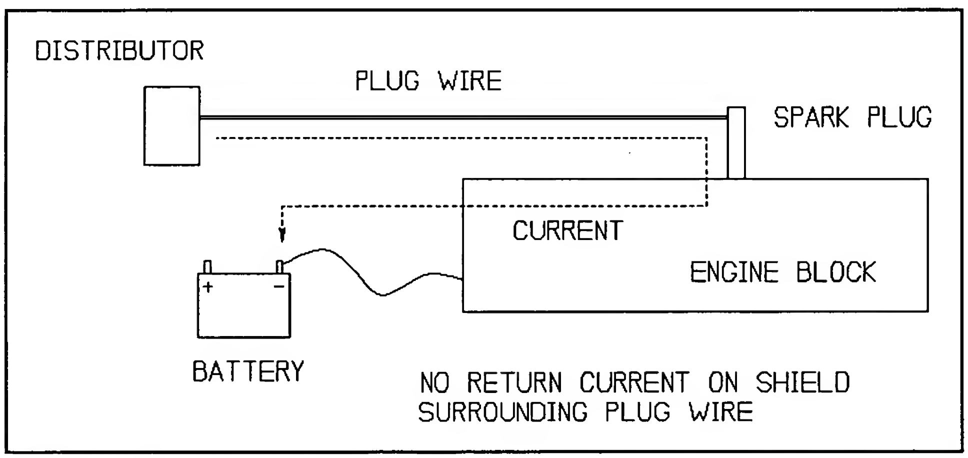
As indicated at the top of the Sketch, other return paths exist which run from the IGNITER to the EXCITER, besides a path

through the shielding. These other return paths take the form of paths running through the metal of the engine, for example.

If these paths exist, then, the net current in the cable may not be ZERO. This is contrary to the situation shown in Sketch 2.

Thus, it may be possible to use an inductive probe to detect spark, by detecting the NET CURRENT surrounded by the probe in Sketch 3. That is, the probe detects the DIFFERENCE between the incoming and outgoing currents.

Sketch 4 illustrates one important difference between an igniter system in a gas turbine engine, and the ignition system used in an automobile.



Sketch 4

As the Sketch indicates, no return current passes through any shielding surrounding the PLUG WIRE, because the PLUG WIRE is not

shielded. All the return current travels through the engine block, to the negative terminal of the BATTERY.

Consequently, none of the current travelling in the PLUG WIRE is cancelled by any return current, returning along a shield surrounding the PLUG WIRE (because no shield is present). As a result, all of the current contributing to the spark is available for detection by an inductive probe.

Thus, from this perspective, an inductive probe in the automotive situation faces a much simpler task, because the signal which it is to detect is larger, because the current generating the signal is not shielded.

Applicants offer some comments on shielding. One type of shielding is shown in Sketch 1, above, namely, a woven conductive sleeve. This type of shielding is designed to block radio-frequency radiation in a spectrum of interest. However, it should be observed that the woven sleeve contains holes. Radiation which is of sufficiently high frequency that its wavelength is about the size of the holes will not be blocked very well.

Another comment is that, even with the shielding of Sketch 1, a magnetic field can still escape the shielding. That is, the B-field indicated in Figure 20 of the Specification can still penetrate the sleeve, if it surrounded the current I in Figure 20. The main reason is that the sleeving, in general, is not made of iron. A contrary conclusion would be reached if the sleeving were

made of steel, or the shielding were a steel pipe, both of which being iron alloys.

Thus, two types (at least) of shielding are in existence: shielding for rf radiation and shielding for magnetic fields. These shields are different.

A third type of shielding is found in aircraft ignition systems, as the Specification, paragraphs 85 and 86, indicates. That shielding is an electrically grounded conductor that prevents personnel from making physical contact with an internal high-voltage conductor.

Response to Rejections of Claims 1, 4 - 6, 8, and 15

These claims were rejected on grounds of anticipation, based on Owens.

Claim 1

Claim 1 recites:

> 1. A method of sensing spark in an igniter in a gas turbine engine, comprising:
>
> a) maintaining a sensor adjacent a surface of the igniter;
>
> b) using the sensor to detect spark; and
>
> c) issuing a signal when spark is detected.

POINT 1

Applicants point out that claim 1 recites "a sensor **adjacent a surface** of the igniter." No "surface" nor "igniter" have been shown in the reference.

Nor has a "sensor" which is "adjacent" the (absent) "igniter" been shown.

MPEP § 2131 states:

> A claim is anticipated only **if each and every element** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.

Applicants submit that the rejection fails to comply with this MPEP section.

POINT 2

The Office Action relies on Owens, column 3, lines 64 - 67, to show the "sensor adjacent a surface of the igniter." That passage of Owens discusses Owens' wire 30.

Owens' Figure 1 shows the wire 30, in which an induced current is induced by an inducing current indicated by the arrow to the right of call-out numeral "31." The induced current is detected, and the detection indicates the presence of the inducing current. (Column 3, line 64 - column 4, line 5.)

Owens states that the wire 30 is placed adjacent the "current

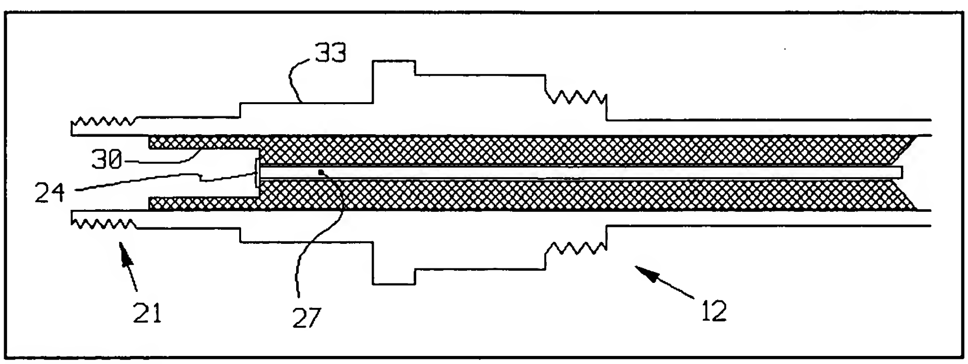
carrying element of interest." (Column 3, lines 64 - 66.) That is, the wire 30 is placed adjacent another wire, which is the "current carrying element of interest."

That other wire is not an "igniter," as claimed. Thus, again, no "sensor" in Owens is "adjacent" an "igniter," as claimed.

Further, the remainder of Owens' detector 10 is not shown as **adjacent** to the igniter. Nor does Owens state that the detector 10 can be placed adjacent the igniter. These claim recitations are also absent from Owens.

POINT 3

Sketch 5, below, illustrates an igniter, and is a rendition of Figure 2 of Applicants' Specification.



Sketch 5

Paragraphs 86 - 94 of the Specification explain why it is unlikely that placing a wire, or an inductor, outside the igniter

will detect current flowing through the igniter. The basic reason is that the metal casing of the igniter acts as electrical shielding.

Also, the conventional wisdom, discussed above, assumes that the NET current in the igniter is zero, so that nothing is present to detect. (The return current cancels the incoming current.)

Therefore, if Owens placed his wire 30, or both his wire 30 and his detector 10, adjacent the igniter, Owens would be **inoperative**.

It is axiomatic that, for a reference to be anticipatory under section 102, the reference must be enabling. (See <u>Patents</u> by D. Chisum, sections 3.06(1)(a) and 304(1).) Consequently, until the PTO rebuts the discussions of Paragraphs 86 - 94 of the Specification, Applicants submit that placing Owens' detector 10 adjacent his igniter will render Owens inoperative.

In addition, Applicants repeat the point that Owens does not show the detector 10 adjacent the igniter.

POINT 4

Owens would be inoperative for an additional reason. His detector 10 contains a diode 34, which is a solid-state device.

Paragraphs 103 and 104 of the Specification indicate that the region adjacent the igniter, during operation, exceeds 400 F. Owens' diode 34 would be probably be inoperative at such

temperatures.

Thus, Owens cannot be interpreted as teaching that his detector 10 is "adjacent" the igniter.

COMMENT

The technical points discussed above, such as those regarding the shielding of the igniter and the temperature of the igniter are considered as relating well-known facts in the gas-turbine art.

Applicants offer to submit an affidavit in support of the technical points, if the Examiner so requests.

Claim 4

Claim 4 recites:

> 4. Method according to claim 1, wherein said surface is electrically conductive and connected to a system ground.

POINT 1

The claimed "surface" has not been shown in Owens. The Office Action asserts that Owens' Figure 1 shows the claimed surface. However, the undersigned attorney has examined that Figure, and can find no surface corresponding to the claimed surface.

Applicants request, under 37 CFR §§ 1.104(c)(2) and 35 U.S.C. § 132, that the PTO specifically identify the claimed "surface" in

Owens.

POINT 2

The PTO relies on Owens' wire 30 to show part of the claimed "sensor."

Claim 4, together with parent claim 1, state that the "sensor" is "adjacent" an "electrically conductive" "surface" which is grounded.

Owens does not state that his wire 30 is insulated. If Owens' conductor 32 is taken as the claimed "surface," then Owens is again rendered inoperative: wire 30 is shorted to ground through contact with conductor 32.

POINT 3

A "surface" which is "conductive" and connected to "ground" generally serves as an electrical shield. Thus, claim 4, in effect, recites shielding around the igniter.

Owens also does not discuss placing his wire 30 adjacent a **shielded** igniter. Thus, the PTO is relying on the Doctrine of Inherency, in asserting that Owens shows these things.

MPEP § 2112 states:

> EXAMINER MUST PROVIDE RATIONALE OR EVIDENCE TENDING TO SHOW INHERENCY.
>
> In relying upon the theory of inherency, the

> examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic <u>necessarily</u> flows from the teaching of the applied prior art.

Applicants point out that the required "basis in fact and/or technical reasoning" have not been shown.

<u>Claim 6</u>

Claim 6 recites:

> 6. Method according to claim 1, wherein the gas turbine engine powers an aircraft, and the signal is issued to a pilot station in the aircraft.

POINT 1

Applicants point out that no "pilot station in the aircraft" is shown in Owens. Owens discusses a gas turbine engine. Those are used in ships, locomotives, power stations, and in other installations besides aircraft. The claimed "pilot station" has not been shown.

POINT 2

The Office Action asserts that the go/no-go signal of Owens is sent to the pilot of an aircraft. However, again, Owens does not say that.

Owens' "Background of the Invention" indicates that the signal is sent to an engine control, not to the pilot. It is well known that, in aircraft, the engine control is situated on the engine.

(The engine control controls things such as the following. It controls the amount of fuel delivered to the engine, based on a throttle signal received from the pilot. It controls fuel-air ratio, which must change as altitude, ambient temperature, and engine speed changes. It controls other things, such as stator vane angle. The engine control is physically located adjacent the engine.)

Therefore, Applicants submit that claim 6 has not been shown in Owens.

POINT 3

The Office Action relies on Owens, column 2, lines 63 - 67, as stating that his engine can be used in aerospace applications. However, at that location, Owens discusses "rockets." Most rockets are unmanned.

Therefore, the Owens passage does not support the conclusion that a signal is issued to a pilot station in an aircraft.

<u>Other Claims</u>

The preceding discussion applies to the other claims in this group.

Response to Rejections of Claims 1, 4, 5, 8, and 15

These claims were rejected on grounds of anticipation, based on Hannah.

Claim 1

POINT 1

Claim 1 recites a "gas turbine engine." Hannah discusses an "automotive" engine, which is clearly of the piston-type, since Hannah is concerned with analyzing multiple spark plugs.

The two types of engines operate on fundamentally different thermodynamic cycles. The gas turbine engine uses the Brayton Cycle. Automobile engines generally use the Otto Cycle.

The claimed "gas turbine engine" has not been shown.

POINT 2

The Office Action asserts that Hannah shows an "internal combustion engine." Apparently, the Office Action is thereby asserting that Hannah also shows a gas turbine engine, since it could be classified as an "internal combustion engine."

However, the fact that Hannah's engine can be placed into a common taxonomic classification ("internal combustion engine") as the claimed engine is insufficient. An analogy will illustrate.

If a claim recites a "hat," that hat cannot be read onto a

"show," on the grounds that both "hats" and "shows" are items of wearing apparel.

The mere fact that a claim element and a prior art element can be placed into the same classification does not mean that the two elements are identical.

Further, as explained in the previous section, gas turbine engines use the Brayton Cycle, while automotive engines use the Otto cycle. Thus, even if the two types of engine are "internal combustion," they are classified differently: Otto and Brayton.

POINT 3

The fact that Hannah's engine may have a common characteristic (internal combustion, as opposed to external combustion, as in a steam engine) as a claimed element does not mean that the claim language covers Hannah's engine. It merely means that the two engines share a common characteristic.

Sharing a common characteristic is insufficient for anticipation, as MPEP § 2131, cited above, states.

POINT 4

The Office Action, in effect, is asserting that Hannah's approach can be applied to a gas turbine engine. Restated, the Office Action is replacing Hannah's automotive engine with a gas turbine engine.

Consequently, this is actually an obviousness rejection, not an anticipation rejection.

In an obviousness rejection, all claim elements must be shown in the prior art. MPEP § 2143.03 states:

> To establish prima facie obviousness . . . **all the claim limitations** must be taught or suggested by the prior art.

The gas turbine engine has not been shown in the prior art.

If the PTO is asserting that the two types of engine are equivalent, then another MPEP section comes into play, namely, MPEP § 2144.06, which states:

> In order to rely on equivalence as a rationale supporting an obviousness rejection, **the equivalency must be recognized in the prior art**, and cannot be based on . . . the mere fact that the components at issue are functional or mechanical equivalents.

The required recognition or equivalency in the prior art has not been shown.

POINT 5

No teaching has been given for applying Hannah's device to a gas turbine engine. As the table in Hannah's column 7, lines 50 - 65 indicates, Hannah detects several other phenomena besides the presence of spark.

No teaching has been given explaining why one would want to detect those other phenomena in a gas turbine engine.

From another point of view, Hannah's "Background of the Invention" states that the electrical signal associated with the spark allows a diagnosis of overall ignition functioning. (Column 1, lines 39 - 41.) However, clearly, Hannah's principles only apply to a piston-type engine. No teaching has been given as to why this analysis is relevant to a gas turbine engine.

POINT 6

As to spark ignition systems, Hanna and the present invention are non-analogous art.

Consider the automotive engine of Hannah. An eight cylinder engine, running at 3,600 rpm, or 60 revolutions per second, must produce 480 sparks per second (480 = 60 revolutions/second x 8 sparks/revolution). Each spark must be precisely timed, to initiate combustion when the piston is at a precise position in its compression stroke.

In a gas turbine engine, the flame in the combustor, once started, is, in general, self-sustaining. There is no need for a spark. However, for safety, igniters are periodically actuated during operation. They may operate continually, by continually producing a stream of sparks.

Paragraph 83 of the Specification provides an example, wherein

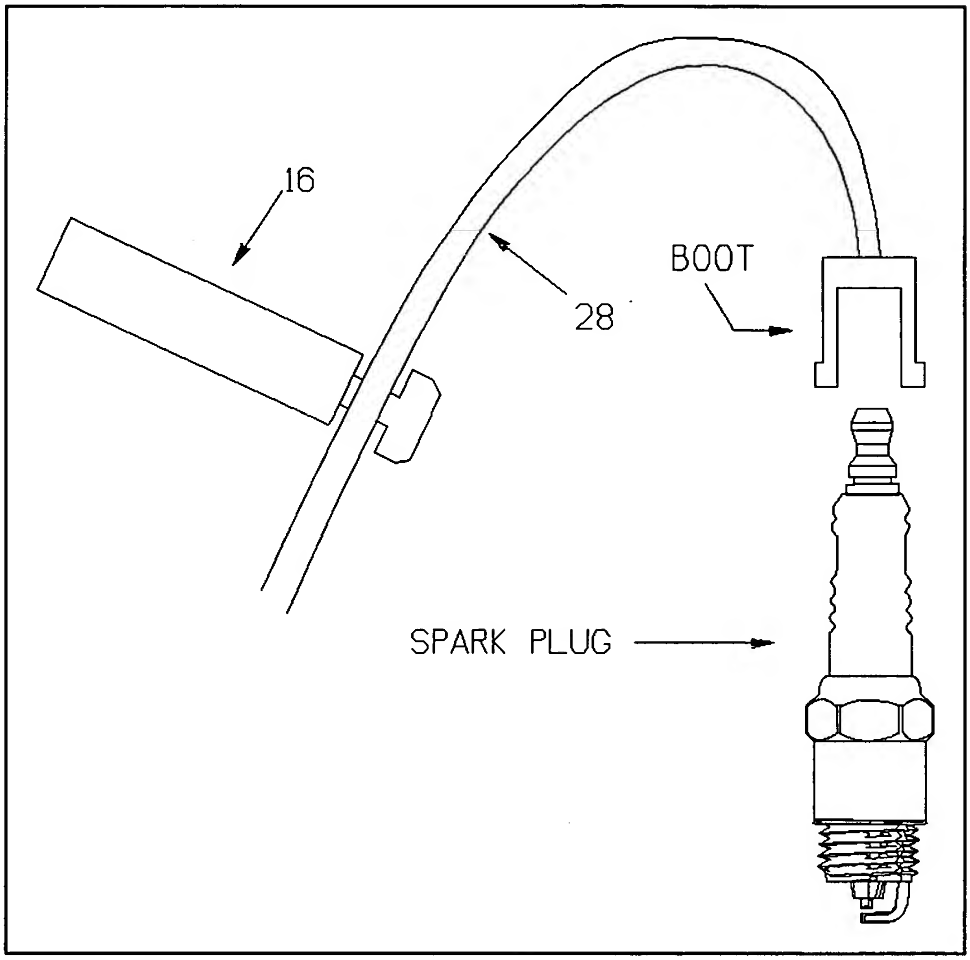
ten sparks per second are generated.

Thus, Hannah is non-analogous art. The spark in Hannah is absolutely essential for engine operation, and the spark must be precisely controlled. The spark in a gas turbine engine, once running, is a safety feature, and can even be eliminated.

Further, no reason has been given as to why Hannah's automotive diagnostic approach would be relevant to a gas turbine engine.

POINT 7

Even if Hannah were applied to a gas turbine engine, claim 1 is not found. Sketch 6, below, illustrates Hannah's system.



Sketch 6

As the Sketch indicates, a notch in Hannah's probe 16 is positioned against ignition wire 28. (See Hannah, Figures 2 and 4; column 4, lines 27 - 30.) But, as Sketch 2 indicates, being against the ignition wire is not being "adjacent" the "igniter" (ie, the spark plug).

It could be argued that, if the probe were placed adjacent the BOOT in Sketch 2, then the adjacency would be present. However,

at least two problems arise.

One is that it is well known that the BOOT is much larger in diameter than the ignition wire. It is not clear that, even if one wanted to do so, that Hanna's probe 16 could fit around the BOOT.

A second problem is that Hannah discusses placing an "ignition wire" into the notch in the probe 16. He does not discuss placing the BOOT there.

Therefore, as Sketch 2 indicates, claim 1 is not found, even if Hanna is applied to a gas turbine engine.

POINT 8

Hannah's probe 16 is detachable from the rest of his apparatus. The probe 16 is applied to the ignition wire, but the rest of the apparatus remains elsewhere. Thus, even if the ignition wire is treated as the claimed "igniter," no "sensor" as claimed is "adjacent" that wire.

That is, Hannah's Figure 2 shows the probe 16 and "wrapping lead 14." (Column 4, line 13.) Plainly, the "wrapping lead 14" is a cable which is wrapped around body 10.

The probe 16 is removed from body 10, and tethered to it by lead 14. Body 10 remains on the fender of a car, while probe 16 is attached to a spark plug wire.

This interpretation is consistent with the presence of switch 24, which must be at a location at which the technician can operate

it. This interpretation is also consistent with LEDs 20 and 22, which must be at a location which is visible to the technician.

Therefore, the entire apparatus of Hannah's Figure 1 is not clamped to the spark plug wire. Only the probe 16. Thus, no "sensor" is "adjacent" an "igniter", as claimed.

And even if the entire apparatus were clamped to a spark plug wire, Sketch 2, above, indicates that the apparatus is not clamped to an "igniter."

POINT 9

It is clear that Hannah is concerned with an inductive pick-up, of the type generically used in an automotive timing light. One of the Inventors herein performed an experiment, wherein an attempt was made to detect spark in a gas turbine engine igniter, using an automotive timing light. A description of the experiment is attached, as APPENDIX A. APPENDIX B is also attached, which explains the term "ground bypass" used in APPENDIX A.

As APPENDIX A indicates, the experiment failed, possibly because of the shielding used in the ignition cables in gas turbine engines.

Therefore, if Hannah is taken as teaching that an ordinary inductive pick-up can be used to detect spark in a gas turbine engine, then the experiment indicates that Hannah is inoperative. As explained above, an inoperative reference cannot anticipate a

claim.

If, as explained above, the rejection is actually of the obviousness-type, then the rejection fails for a different reason.

MPEP § 706.02(j) states:

> Contents of a 35 U.S.C. 103 Rejection
>
> . . .
>
> To establish a prima facie case of obviousness, three basic criteria must be met.
>
> . . .
>
> Second, there must be a reasonable expectation of success.
>
> . . .
>
> The . . . reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

No expectation of success in applying Hannah's pick-up to a gas turbine engine has been shown, and the experiment indicates that such a showing would be impossible.

<u>Claim 4</u>

Claim 4 recites:

> 4. Method according to claim 1, wherein said surface is electrically conductive and connected to a system ground.

Hannah shows the **opposite** of claim 4.

In Hannah's Figure 2, the probe (on the left) is placed adjacent spark plug wire 28.

-- That wire 28 is covered with a rubber insulator. That insulator is not "electrically conductive," as claimed.

-- The conductor within that insulator is connected to a first electrode within the spark plug, which is separated from a second electrode by an air gap. The second electrode may be connected to ground, but the first electrode is not, because of the air gap.

Therefore, for at least the preceding two reasons, Hannah does not show claim 4.

Remaining Claims

The discussion above applies to the remaining claims in this group.

Response to Rejection of Claims 7, 9, and 10

These claims were rejected as obvious, based on Owens and Warner.

Claim 7

POINT 1

Claim 7(5) states:

> 5) the sensor is wholly external to both conductive shields.

This recitation has not been shown in the applied references, even if combined. MPEP § 2143.03 states:

> To establish <u>prima facie</u> obviousness . . . **all the claim limitations** must be taught or suggested by the prior art.

POINT 2

Warner actually shows the **opposite** of what is claimed. Warner's DETECTOR MEANS 23 lies **inside** the shielding 25. It is reasonable to assume that the DETECTOR MEANS 23 is contained within a metallic box, which is connected to shielding 25.

Thus, again, even if the references are combined, the claim is not attained.

POINT 3

Warner actually shows the **opposite** of what is claimed. Warner's rod 22 is the inductive element which detects current. (Column 3, lines 60 - 65.) Rod 22 lies **inside** the shielding 25. As Warner's Figure 2 indicates, rod 22 is **inside** a shielded case. (Column 4, lines 25 - 35.)

Thus, again, even if the references are combined, the claim is not attained.

POINT 4

The experiment, described in APPENDIX A, indicates that placing the sensor of Owens outside the shielding would render the sensor inoperative.

POINT 5

No teaching has actually been given for combining the references. The rationale (Office Action, bottom of page 6) is that adding shielding to Owens would "prevent radiation from external sources."

That rationale is technically incorrect, since the addition of the shielding does not prevent radiation from emanating from "external sources." The shielding is not present at the "external sources." How can it prevent radiation ?

Further, if the rationale contains a typographical error, and intended to state that the shielding prevents radiation from **reaching** "external sources," that does not lead to a combination of the references.

Warner **by himself** attains that goal. There is no reason to add the other reference.

POINT 6

The Experiment (APPENDICES B and C, attached) seems to indicate that adding the shielding to the references, as proposed by the PTO, would render the combination inoperative.

Applicants submit that the PTO must show an "expectation of success" which overcomes the Experiment, under MPEP § 706.02(j), cited above.

Claim 9

Claim 9 recites:

> 9. Method according to claim 1, wherein the sensor comprises a coil, and part of the igniter forms a core of the coil.

If this claim is applied to Owens, the claim language is not found. Owens' "igniter" does not form a "core" of the "coil." The only possible "core" would be wire 32, which is not an "igniter."

If this claim is applied to Warner, the claim language is still not found. For the claim language to apply, Warner's SPARK PLUG would need to be a "core" of rod 22. That is not so.

Thus, even if the references are combined, claim 9 is not found.

Claim 10

Claim 10 recites:

> 10. Method according to claim 7, wherein the second conductive shield comprises a housing of the igniter.

The undersigned attorney cannot locate this recitation in the references, even if combined, and requests that it be identified.

<u>General Point</u>

MPEP § 706.02(j) requires that

1) a likelihood of success be shown in a combination of references and

2) the likelihood be shown in the prior art.

The undersigned attorney has examined Owens and Warner, and cannot see how the wire 30 of Owens can be used to detect spark in Warner.

Therefore, it is requested that a diagram be given, showing what is actually obtained in combining the references, in order to show the required likelihood of success. It is specifically requested that an explanation be given of how the spark is detected through the shielding.

Response to Obviousness Rejection of Claims 2 and 3

These claims were rejected as obvious, based on Owens and DeFreitas.

Claim 2 is considered patentable, based on its parent.

Claim 3 states that the sensor is in contact with the surface of the igniter. As explained above, Owens does not show that.

Added Claims

Claim 16

Claim 16 states that the shield runs the full length of the conductor. That has not been shown in the references.

Claim 17

Claim 17 states that part of the return current passes through the shielding, making the net current in the shielded cable non-zero, and that the non-zero current is detected. That has not been shown in the references.

Claim 18

Claim 18 recites (1) an inductor **adjacent** the "surface" and (2) a capacitor **away from** the "surface." That has not been shown in the references.

Claim 19

Claim 19 recites a difference between incoming and return current, and detecting the difference. That has not been shown in the references.

Claim 20

Claim 20 recites a condition wherein no signal is produced (even though a spark would be present). That has not been shown in the references.

Claim 21

The discussion of claims 17 and 19 apply here.

Claim 22

The discussion of claim 18 applies here.

Conclusion

Applicant requests that the rejections to the claims be reconsidered and withdrawn.

Applicant expresses thanks to the Examiner for the careful consideration given to this case.

Respectfully submitted,

Gregory A. Welte
Reg. No. 30,434

806 North County Road 700 West
Frankfort, IN 46041
(765) 296 - 4600
August 12, 2005

ATTACHED:

APPENDIX A, two pages (Experimental Results)
APPENDIX B, one page (Definition of term in Experimental Results)

Ignition Spark Sensor Invention — Additional testing using an Automotive Timing Light as Sensor.

Robert Ponziani, one of two inventors of subject patent application.
May 27, 2005

Test Setup

Test Conducted on May 25, 2005.

A Craftsman Automotive Inductive Timing Light Model # 161.213400 was selected for the test. There were no serial numbers present on the unit. The sensor end, or "pick-up", is an inductive coil device with a light metallic core, and resides in a spring-loaded clamp that is normally clipped around and surrounds the electrical lead to an automotive spark plug. When the clamp ends make contact as the clamp is closed, the unit will provide maximum signal strength to the electronics in the main body of the timing light.

It was initially tested on an automobile, which verified that it was in working condition. This unit was then used as part of the test set-up in a gas turbine development ignition lab. A standard gas turbine ignition set-up was constructed, which included the important ground bypass discussed in the patent application, and the subject timing light was installed.

The timing light power input lead was energized with a 12-volt DC voltage source as required, set to 12.5 volts DC, and measured to verify the voltage value. The inductive sensor clamp was installed over the gas turbine ignition lead, but due to the much larger gas turbine ignition lead diameter, the sensor clamp would not fully close around the gas turbine ignition lead. This concern is addressed below.

Tests Conducted and Results

1) The gas turbine ignition system was energized, which produced the standard 2 sparks per second at the igniter tip. The timing light trigger switch was pulled, and no light output indications occurred from the timing light.

2) A piece of non-magnetic steel was inserted into the sensor lead clamp to bridge the approx 3/8" gap in the open end of the clamp. This allowed the maximum signal strength available to go into the timing light. Again, the timing light trigger switch was pulled, and no light output indications occurred.

3) The above two tests were each repeated, with the same results that there were no output indications from the timing light.

Conclusion
The results show that using the automotive timing light method is not useful for gas turbine ignition systems. There are substantial differences between the two ignition

APPENDIX A

systems, but the reasons why the automotive timing light is not compatible with the gas turbine ignition system were not investigated.

There are a few *possible* reasons, such as incompatible signal conditioning circuitry inside the timing light, signal suppression from the heavy braided grounding shield on the outside of the gas turbine system that is not used on the automotive system, smaller capacitance in the timing light's signal conditioner, or other circuit incompatibilities such as signal protection circuitry that reacts to the high current flow from the gas turbine system.

For whatever reason, the automotive timing light was not found usable for detecting spark events from a gas turbine ignition system.

Robert Ponziani 5/27/05

Robert Ponziani, Licensed Professional Engineer
May 27, 2005

APPENDIX A

TO 7105-...

"Ground bypass" refers to the following. One ground path can follow the shielding of the cable, as indicated by path R2 in Figure 22 of the Specification. In addition, another path is available, namely, a path R1 through the engine as a whole. This latter path is referred to as "ground bypass," since it bypasses the path R2 through the shielding.

June 13, 2005

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APPENDIX B